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Silage pretreatment and enzymatic hydrolysis of green energy grass for 2nd generation bioethanol production.

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Pretreatment and enzymatic hydrolysis for conversion of lignocellulosic biomass to fermentable sugars is often the most expensive steps in 2nd generation bioethanol production. The presented work aimed at studying a pretreatment method at high dry matter (DM) and low temperature, using silage treatment combined with enzymatic hydrolysis. Ensiling is an anaerobic biological process where lactic acid bacteria consume free soluble sugars in the biomass and produce lactic acid. The drop in pH prevents further biological degradation and thus conserves the biomass. The biomass used in the study was two species of high yielding energy grass (ca 15-17 tonnes DM/hectare). Their content of free sugars and moisture makes them suitable for ensiling. The fresh grass was dried to DM between 25-50%, cut to 2-4 cm, sprayed with and without industrial silage inoculums, ensiled in plastic bags at 99% vacuum and disrupted at different times. The ensiled grass was hydrolysed by Cellic™ CTec enzymes, and the efficiency of the treatment was measured in ethanol yield by batch fermentations with *Saccharomyces cerevisiae*. The pretreatment method presents a simpler, less energy intensive and far cheaper possibility of producing 2nd generation bioethanol. Furthermore, it can potentially be implemented at the biomass producers (the farmers) and used, at the same time, as a storage method for bioenergy-biomass.